Saskatchewan Agriculture and Food

Canaryseed in Saskatchewan

Revised: December 2006

Introduction

Figure 1. Canaryseed late-flowering stage. Source: SAF

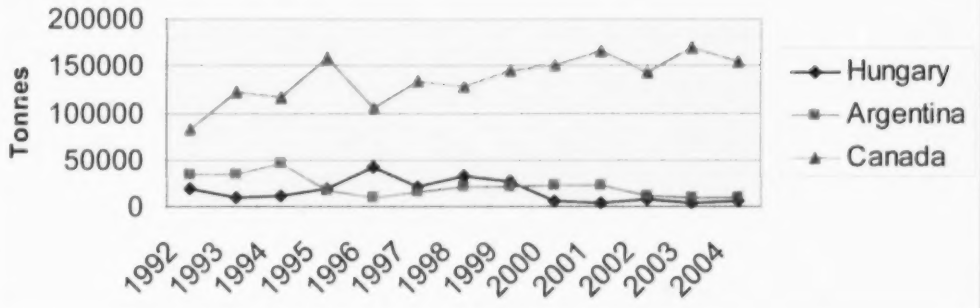
Canaryseed (*Phalaris canariensis*), or annual canarygrass, is a major component of feed mixtures for caged and wild birds. A member of the grass plant family (Graminaceae), it is an important special crop in Saskatchewan. The seedlings resemble green foxtail or corn seedlings, are finely leafed, and purple to red at the base of the stem. Mature plants are approximately one metre in height and have small compact heads (Figure 1). There are two types of canaryseed: itchy and itchless. Tiny, sharp silica hairs at the base of the seed of older varieties make canaryseed dust very irritating to the skin during harvest and handling. The Crop Development Centre (CDC) at the University of Saskatchewan has developed canaryseed without these hairs, called the itchless (or glabrous) type. Canadian canaryseed varieties with the glabrous trait have been grouped under the marketing name Canario®.

The canaryseed bushel weight of the itchy type is 50 lb., while the itchless type is 56 lb. Average feed nutrient values of canaryseed straw are: crude protein four to five per cent, TDN 40 to 48 per cent, calcium 0.3 per cent, and phosphorus 0.3 per cent. Recent research carried out at the CDC has outlined the nutritive value of the seeds of canaryseed, and further research is underway to modify the crop to make it suitable for human consumption.

The major canaryseed producing countries are Canada, Hungary, and Argentina. World canaryseed production has ranged from 151,000-377,000 tonnes (t) in recent years. Seeded acreage in Canada has ranged from 113,000-356,000 hectares (ha) or 280,000-880,000 ac. in the past 10 years, with over 90 per cent of production grown in Saskatchewan. The 10-year average yield in Saskatchewan is 1,000 kg/ha (900 lb./ac). There were approximately 119,000 ha (295,000 ac.) of canaryseed planted in Saskatchewan in 2006. The Saskatchewan Agriculture and Food (SAF) publication, Specialty Crop Report, provides more statistical information on the production and export of canaryseed. World exports ranged from 149,000-233,000 tonnes during the period from 1992 to 2004 (Figure 2).

Figure 2. Leading Canaryseed Exporting Countries

Source: FAO



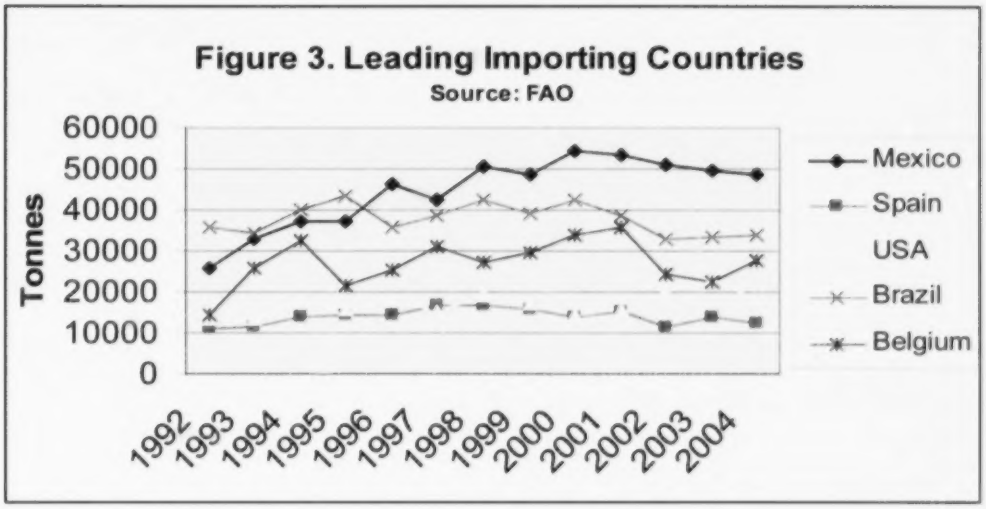
Market Opportunities

Canada is the largest producer and exporter of canaryseed in the world and provides over one-half of total annual world production and world trade. Fluctuations in production of canaryseed in Saskatchewan can have a major impact on world price and the market is characterized by large price swings. World consumption of canaryseed, on the other hand, remains fairly constant regardless of price, indicating little substitution of other crops for canaryseed. Demand and consumption does not fluctuate greatly during periods of recession. Birds are popular pets for apartment dwellers, and strong export markets exist in countries with high urban populations such as Mexico, the United States, Belgium, Spain, Italy, and Brazil. World canaryseed imports (Figure 3) ranged from 169,000-308,000 tonnes during the period from 1992 to 2004.

Commercial bird feed is made by blending crops such as millet, safflower, canaryseed, flax and canola. Bird feed is sold into two main markets, indoor and outdoor. No standards exist for mixes or packaging.

Western Canada supplies most of the bird feed ingredients required by both the indoor and outdoor domestic packaging industry. Packagers distribute bird feed mixes locally through retail and grocery chains and pet stores. Some processors package, label and customize products exclusively for pet, grocery and hardware store chains. Large processors distribute to large and small retail stores and major users such as zoos and wild animal farms.

Research is underway to uncover potential new markets for canaryseed. Possible human consumption uses are sesame seed replacement, specialty starch, and vermicelli noodles. Cultivars with potential for human consumption are itchless and have a yellow seed coat. Other new markets may include pet food and livestock feed.



Canaryseed Development Commission of Saskatchewan (CDCS)

The check-off on the commercial sales of canaryseed grown in Saskatchewan was approved under the *Agri-Food Act, 2004*. The CDCS established a canaryseed check-off to:

- Support research into new markets including human consumption;
- Support canaryseed research in plant breeding and agronomy;
- Attract other development support such as government funding only available with matching money;
- Put growers in control.

Highlights of the canaryseed check-off include: mandatory but refundable check-off; the levy is $1.75 per net tonne on commercial sales of canaryseed grown in Saskatchewan; canaryseed grown for planting seed is exempt; and growers will remain registered if they have sold canaryseed within the past three years and not received a refund.

Adaptation

Canaryseed is a cool season crop that does best in long, warm days and cool nights, making it well adapted to western Canada. It matures in approximately 105 days. Canaryseed is shallow rooted, and is more sensitive to heat and less drought tolerant and salt tolerant than wheat. It does best on heavy, moisture-retentive soils.

Major areas of production in Saskatchewan are near Kindersley, the Regina plains, and Melfort. Canaryseed can be grown successfully wherever wheat grows well, except in drier areas within the Brown soil zone. Canaryseed can tiller profusely and may lodge

when soil fertility and moisture are plentiful. Under these conditions, a large amount of vegetative growth may be produced that does not necessarily lead to high seed production.

Canaryseed is susceptible to the soil residues of a number of herbicides (See Weed Control). It is important to record herbicide use each year and to avoid planting canaryseed in fields with a recent history of the products listed. The SAF publication, Guide to Crop Protection, contains more information about herbicides and their soil residual properties.

Varieties

Five canaryseed varieties are registered in Canada: Keet, Elias, Cantate, CDC Maria and CDC Togo. Elias has a larger head and longer straw, while Keet is earlier maturing and has improved lodging resistance. Keet and Elias have a bushel weight of 50 lb. CDC Maria and CDC Togo represent a breakthrough in canaryseed breeding as they do not contain the tiny hairs on the seed that cause irritation, and thus they are described as "itchless" or "glabrous." CDC Maria and CDC Togo have a 12 per cent higher bushel weight (56 lb./bu.) than Keet, Elias or Cantate. CDC Maria yields, on average by weight, 10 per cent less than Keet. This, combined with CDC Maria's higher bushel weight and less chaff, produces a total yield volume 25-30 per cent less than Keet. CDC Togo has similar yields to Keet, Elias and Cantate. Elias pedigreed seed has not been produced in recent years. Further information on canaryseed varieties is available in the SAF publication, Varieties of Grain Crops.

Table 1: Canaryseed variety descriptions compared to CDC Maria

Name	Type	# of Trials	% Yield of CDC Maria	Days to Head	Days to Maturity	Height cm	Test Weight lb./bu.	Weight per 1,000 seeds gm
CDC Maria	glabrous	44	100	55	97	96	54	7.3
CDC Togo	glabrous	44	113	+2	+2	+2	-1	+ 0.8
Keet	hairy	44	111	-1	0	+2	-6	- 0.3
Cantate (2004/05 only)	hairy	4	114	+2	+5	-2	-8	+ 0.9

Seeding

In Saskatchewan, canaryseed yield tends to decrease as seeding is delayed. Best results have been achieved when canaryseed is seeded by May 1 in southwest Saskatchewan, and by May 15 in the rest of the province. Late seeding can lead to delayed maturation of the straw during harvest. Green or tough canaryseed straw can

be extremely difficult to thresh.

Due to its small seed size, care should be taken to ensure that seeds are placed into firm, moist soil usually no deeper than six cm (2½ in.). Canaryseed seedlings do not thrive in cold and wet, or water logged, soil.

Under good weed control conditions, canaryseed yield does not improve with increased seeding rate. A seeding rate of 34 kg/ha (30 lb./ac.) is recommended. However, rates of 22-45 kg/ha (20-40 lb./ac.) have been successfully used. A higher plant density is recommended when weed pressure is high or seeding conditions are poor.

Fertilization

Do not compromise seedbed quality by placing too much fertilizer with the seed. Side-band drills are favoured over mid-row band drills. Canaryseed is a shallow rooted crop; therefore, soil testing should be focused on the 0-30 cm (0-12 in.) soil depth. Research carried out over a five year period by Agriculture and Agri-Food Canada (AAFC) Indian Head at a number of sites in Saskatchewan compared the yield response of canaryseed to varying levels of added nitrogen fertilizer. Results from the study provide a general recommendation for the addition of 34-45 kg/ha (30-40 lb./ac.) actual nitrogen in canaryseed crops. Yields did not typically increase at nitrogen rates above this level.

Unlike wheat, only a small amount of N-fertilizer can be safely placed with the seed of canaryseed. Research carried out at the University of Saskatchewan found that the tolerance of canaryseed to seed-placed N-fertilizer is similar to that of oilseeds. The amount of fertilizer that can be safely seed-placed depends on seeding equipment, type of opener, type of fertilizer, soil moisture and texture, and climatic conditions. If seedbed moisture conditions are not good to excellent, then rates of seed-placed N-fertilizer must be reduced. Side-banding and mid-row banding N-fertilizer are viable options where higher rates of fertilizer are required. For more information, refer to the canola and flax sections of the Saskatchewan Agriculture and Food publication, Guidelines for Safe Rates of Fertilizer Applied with the Seed.

Phosphorus fertilizer application should be based on a soil test. The amount needed will vary from field to field and should be placed with or very near the seed. Seed-placed rates should not exceed 33 kg P_2O_5/ha (30 lb. P_2O_5/ac.) under good to excellent seedbed moisture conditions, based on a 2.5 cm (1 in.) spread and a 22.5 cm (9 in.) row spacing.

The response of canaryseed to potassium chloride (KCl) has been mixed. Research results indicate a positive yield response at some sites while the addition of potassium sulphate (K_2SO_4) did not improve yields. Research is underway to further study the importance of chloride and potassium in canaryseed production.

If potassium is applied, the rate of seed-placed K_2O plus seed-placed phosphate (P_2O_5) should not exceed the safe rate of seed-placed phosphate in the P guidelines table in the SAF publication, Guidelines for Safe Rates of Fertilizer Applied with the Seed. Sulphur has had no consistent effect on canaryseed yield.

Weed Control

Early in the growing season, canaryseed develops slowly and competes poorly with weeds. Use clean seed to avoid the spread of weeds. Avoid areas where volunteer cereal competition is anticipated. Do not seed canaryseed on flax stubble as the two seeds are difficult to separate. Delayed seeding to control early flushes of annual weeds with cultivation can lead to reduced yields, late maturity and straw that will not easily thresh at harvest.

Canaryseed is not appropriate for post-emergent harrowing, as the small seedlings are removed as easily as weed seedlings.
Most annual weed species can be controlled by herbicides. Herbicides registered for the control of wild oats in canaryseed are Avadex MicroActiv® and Avenge®. Herbicides registered for the control of broadleaf weeds are: dicamba or Banvel II® / Oracle® + MCPA Amine, bromoxynil + MCPA ester products or Buctril-M® / Mextrol® / Badge®, bromoxynil based products Pardner® / Koril®, Curtail M®, Prestige®, Trophy®, and Target® / Sword®. Applications of ester formulations of 2,4-D have caused crop stunting, irregular growth, and reduced canaryseed yields. There are no herbicides available to control volunteer cereals. Always read and follow herbicide product labels before using herbicides in canaryseed. The SAF publication, Guide to Crop Protection, provides information on the use of herbicides.

A number of grassy weed herbicides will cause severe injury or death to canaryseed, and care must be taken to avoid drift of these products onto the crop. Research conducted with Puma 120 Super on canaryseed has found that it will cause severe injury to the crop. Symptoms include yellowing, severe stunting, weakened stems increasing the risk of lodging, and yield loss.

Canaryseed is also susceptible to a number of herbicide residues in the soil and should not be seeded for at least 24 months after spring trifluralin or Edge®, or 30 months after a fall trifluralin or Edge treatment. Canaryseed should not be seeded until at least the second season following an application of Assert® or Unity®. Fields treated with Ally®, Glean®, Amber®, Muster®, Everest®, Sundance® or Pursuit® should not be sown to canaryseed until a field bioassay determines it is safe to do so. Extended periods without rainfall during the growing season may extend the re-cropping restrictions on residual products. This may also impact waiting periods for products like Odyssey® that do not have restrictions for the following year under normal moisture conditions.

Insect Control

Aphids are attracted to canaryseed, so producers should start checking their fields for the presence of aphids at the early heading stage. Canaryseed can be attacked by the bird cherry-oat aphid (*Rhophalosiphum padi*) and the grain aphid (*Macrosiphum avenae*). The bird cherry-oat aphid is very dark green, while the grain aphid is a light green. Often, these aphids are not abundant enough to cause economic losses. However, if southerly airflow conditions in the spring allow for early infestations, significant crop injury can occur.

The aphids often hide along the small stem (rachis) inside the canaryseed head. The head should be bent and closely inspected when making counts to determine infestation levels. The bird cherry oat aphid will also feed on the stems, underside of leaves, and in the canaryseed boot (the area where the flag leaf joins the central stem) before heading. Aphids will often be present in various sizes due to their different ages. Research has not been carried out to determine economic thresholds for aphid infestations in canaryseed in Saskatchewan. Information from the United States and from other cereal crops indicates that approximately 10-20 aphids on 50 per cent of the stems prior to the soft dough stage may cause enough crop damage to warrant insecticide application. The economic threshold for insecticide application is also impacted by the canaryseed price, with the threshold number being low when the canaryseed price is high.

Malathion, Cygon® and Lagon® are registered for control of aphids in canaryseed. If aphids are present, the insecticide should be applied at early heading, around mid to late July. Aphids do little economic damage by the soft dough stage of the seed, so spraying after that stage is not recommended. More information on control of aphids in canaryseed can be found in the SAF publication, Guide to Crop Protection.

Disease Control

Septoria leaf mottle (*Septoria triseti*) can be destructive in years when wet conditions favour disease development. The disease is also favoured by lush dense foliage that occurs in conditions of high moisture and nitrogen fertility.

After wet summers, growers sometimes report surprisingly low yields and lower than average bushel weights. Some of this loss can be attributed to septoria leaf mottle. Early symptoms of septoria leaf mottle are difficult to recognize, as the contrast between healthy green leaf area and diseased leaf area is not pronounced. Lower leaves that have been shaded by a dense canopy may have a distinctive symptom - "green islands." Green islands are infected spots that remain green as the rest of the leaf yellows. Close inspection of the diseased area or discoloured leaf tips (Figure 4) will reveal a large number of pycnidia (small, black spore-producing bodies) that look like pepper sprinkled on the leaf. A magnifying glass will assist in identifying pycnidia that

are embedded within the leaf. Under wet conditions, pycnidia ooze golden brown globs of spores that spread to healthy leaves by rain splash. In severe infestations, the pycnidia can cover the entire plant including the head.

When the pycnidia are present on the head, spores will most likely find their way onto the seed during harvest. It is not known if these spores can survive on the seed until the following spring, but it is advisable to obtain different seed if infection was likely.

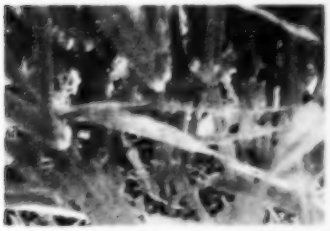


Figure 4 Symptoms of canaryseed leaf mottle. Source: SAF

Septoria leaf mottle on canaryseed is a residue-borne disease. Canaryseed crops that have been sown on, or adjacent to, canaryseed stubble are considered high risk.

Growers should examine their fields for signs of disease. A crop rotation with at least a two-year break from canaryseed is the best way to reduce economic infestations of the disease. Tilt® 250E, Bumper® 418 EC and Pivot® 418EC are foliar fungicides registered for the control of septoria leaf mottle in canaryseed. Consult the product label or the SAF publication Guide to Crop Protection for more information. Minor diseases of canaryseed that typically do not result in economic damage include ergot, fusarium head blight, common root rot and spot blotch.

Floret Blasting

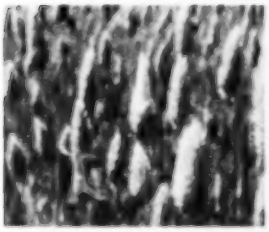


Figure 5. Floret blasting on Canaryseed. Source: SAF

Canaryseed is shallow rooted and more sensitive to heat and drought than wheat. Mechanisms used by the plant to adjust for stress include tiller die-back and blasting of the top portion of the head (Figure 5). If these top florets are not pollinated, they will die and turn white.

Harvesting

The presence of tiny hairs at the base of the seed of older varieties makes canaryseed dust very irritating to the skin during harvesting and handling. Research has linked this dust to respiratory health problems. Dust masks should be worn when handling this crop.

Canaryseed is very shatter resistant and can be straight-combined. Swathing should be delayed until the crop has reached full maturity and then immediately combined. Canaryseed can be swathed slightly earlier and permitted to cure in the swath. However, do not swath when the straw is still green. The straw is very wiry and can be difficult to thresh if cut before maturity. In this situation, the seed may already be very

dry and prone to dehulling before the straw is mature. The crop will dry faster and receive less bird damage if it is standing rather than in a swath. Canaryseed heads tend to remain intact after threshing so they should be checked for the presence of remaining seeds. Combine cylinder or rotor speeds should be approximately 500-750 rpm. Caution must be taken to keep dehulling to a minimum, since dehulled canaryseed is classed as dockage and must be cleaned out. Canaryseed with the hull intact is shiny and golden yellow, while dehulled canaryseed is dark brown.
Wind and sieve settings should be set similar to flax. Augers should be run full to decrease dehulling. Most marketers consider canaryseed is safe for storage at 13 per cent moisture on the canaryseed chart.

Processing

Canaryseed should be cleaned before it is shipped for export. Saskatchewan has a large special crop primary processing industry. Canaryseed is cleaned to exporters' specifications, usually a minimum purity analysis of 99 per cent pure seed, with a maximum of four per cent dehulled seed. Flax and green smartweed seed is difficult to separate from canaryseed, and buyers will avoid purchases containing these seeds. Most canaryseed is sold to export markets in bulk or in bags.

Grading

Canaryseed does not fall under the authority of the *Canada Grain Act*, so the Canadian Grain Commission (CGC) has not established grades for the crop. However, the CGC does perform dockage analysis on samples submitted.

Marketing

Canaryseed production contracts are available from a number of special crop marketing companies. A contract provides producers with the option of locking in a price and a market for a portion of their production before the growing season. The SAF publication, Saskatchewan Special Crop Marketing Company Synopsis, provides a list of companies contracting and purchasing canaryseed.

Economics of Production

The SAF publication, Crop Planning Guide – Specialty Crops, contains annually updated information on the estimated cost of production and projected returns from canaryseed.

Additional Information

Saskatchewan Agriculture and Food
-Agriculture Knowledge Centre Toll Free at 1 866 457-2377
-Saskatchewan Agriculture and Food website: www.agr.gov.sk.ca/
-Specialty Crop Report
-Guide to Crop Protection
-Varieties of Grain Crops
-Saskatchewan Special Crop Marketing Company Synopsis
-Crop Planning Guide - Specialty Crops
-Guidelines for Safe Rates of Fertilizer Applied with the Seed

Acknowledgements

R. McVicar, S. Hartley, C. Brenzil, P. Pearse, K. Panchuk, Saskatchewan Agriculture and Food
P. Hucl, Crop Development Centre, University of Saskatchewan
B. May, Agriculture and Agri-Food Canada